

AMENDMENTS TO THE DRAWINGS

Attached hereto is(are) three (3) sheet(s) of corrected drawings that comply with the provisions of 37 C.F.R. § 1.84. The corrected drawings incorporate the following drawing changes:

Figures 13-17 were designated with the legend "BACKGROUND ART" in order to comply with the Examiner's objection to the drawings and place them in full compliance with 37 C.F.R. § 1.121(d).

It is respectfully requested that the corrected drawings be approved and made a part of the record of the above-identified application.

REMARKS

Claims 1-9 and 11-16 are currently pending in this application, with claims 1 and 13 being independent. Claims 1, 2, 4, 5, 7 and 8 have been amended to more appropriately define the present invention. New claims 11-16 have been added to define additional aspects of the invention. Claim 10 has been cancelled without disclaimer or prejudice of the subject matter thereof.

Drawings

In the outstanding Office Action, the Examiner objected to Figures 13-17 indicating they should be designated by a legend, such as "Prior Art," because allegedly only that which is old is illustrated. Applicants' have provided replacement sheets for Figures 13-17, each being designated with the legend "Background Art" in compliance with M.P.E.P. § 608.02(g) and 37 C.F.R. § 1.121(d). Accordingly, Applicants respectfully request the Examiner to withdraw the objection to Figures 13-17.

Information Disclosure Statement

In the outstanding Office Action, the Examiner indicated that a submitted Information Disclosure Statement did not contain an International Search Report as indicated. On January 31, 2005, Applicants resubmitted the International Search Report by facsimile to the Examiner. If there are any other outstanding concerns regarding this issue, the Examiner is requested to contact the undersigned by telephone in order to resolve them.

Claim Rejections – 35 U.S.C. § 112

The Office Action indicated that claims 1-10 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner indicated the claims contained subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. Specifically, the Examiner alleged that the specification does not provide a description of the claimed “pulse-modulation process.”

Applicants respectfully direct the Examiner’s attention to, for example, page 9, line 5 through page 10, line 18; Figures 5B through 5E’, which are directed to the pulse duration modulation process. At least from this portion of the specification, one of ordinary skill in the art would appreciate that the Applicants had possession of the claimed subject matter at the time the application was filed.

Accordingly, Applicants respectfully request the Examiner withdraw the § 112, first paragraph, rejection of claims 1-10.

Claim Rejections – 35 U.S.C. § 102

The Office Action indicated that claims 1-10 are rejected under 35 U.S.C. § 102(b) as being anticipated by U. S. Patent No. 6,226,228 to Hossack et al. (“Hossack”). Applicants submit the Examiner has failed to establish a *prima facie* case of anticipation and traverse this rejection.

Hossack merely discloses a method for imaging a target which includes the steps of transmitting ultrasonic energy at a fundamental frequency and receiving reflected ultrasonic energy at a harmonic of the fundamental frequency (column 1, lines 54-57). Specifically, Hossack discloses a transmit beamformer 40 including end channels, one for each transducer of the transducer array 16. Each channel includes a delay memory 42, a waveform memory 44, and a delay counter 46. The waveform memory 44 stores a single waveform in digital form which is used for all transmit scan lines. (See column 3, lines 29-46; Figure 2.) In use, each channel responds to a scan line selection signal on line 52 by loading word 48 for the selected scan line into the delay counter. The delay counter 46 responds to a start of scan line signal on line 54 by incrementing the stored value with each cycle of the 40 MHz clock on line 50. When the counter 46 increments to zero, it enables waveform memory 44. Subsequently generated values of the counter 46 become address values for the waveform memory 44. As each word of the waveform memory 44 is addressed, the corresponding 8 bit word is read and applied to a digital-to-analog converter 56 (column 3, line 61 through column 4, line 5).

Conversely, Hossack fails to disclose, at least, "a control signal for each channel to generate a carrier drive signal, further wherein the control signal is based upon at least one channel dependent parameter," as recited in claim 1.

Hossack is distinguished from the recited feature in claim 1 at least in that the signal is produced merely by reading the values out of waveform memory which are controlled by scan line signal and a 40 MHz clock signal on line 50. (See column 3, lines 61-65.)

Accordingly, Applicants respectfully request the Examiner withdraw the rejection of claim 1. Dependent claims 2-9 are allowable, at least, by virtue of their dependency from allowable claim 1.

The Office Action indicated that claims 1-10 are rejected under 35 U.S.C. § 102(b) as being anticipated by U. S. Patent No. 6,117,082 to Bradley et al. ("Bradley"). Applicants respectfully traverse this rejection.

Bradley merely discloses a medical diagnostic ultrasonic imaging method and system which performs imaging using signals having frequencies which are fractions of the fundamental frequency of the associated transmit beam (see Abstract). Specifically, the transmitted pulse is designed such that the efficiency of the contrast agent bubble and generating subharmonic distortion is improved by including a low level subharmonic seed in the transmit waveform. (See column 1, lines 61-66.) Specifically, Bradley discloses a medical ultrasonic diagnostic imaging system 10 which includes an ultrasonic transmitter 12 and receive beamformer 14 which are coupled to a transmit receive switch 16 to a phased array transducer 18. The transducer 18 includes a linear array of separate transducer elements. Each element responds to a specific transmit signal supplied by the transmit receive switch 16, and the phasings and amplitude of these transmit signals are controlled to cause ultrasonic waves generated by the transducer elements to add coherently along the selected beam or scan line direction. (See column 10, line 55 through column 11, line 2). Bradley further discloses a transmitter which includes two separate programmable waveform generators 20, 22, each of which generates respective ultrasonic pulse.

Conversely, Bradley fails to disclose, at least, “a control signal for each channel to generate a carrier drive signal, further wherein the control signal is based upon at least one channel dependent parameter,” as recited in claim 1.

Bradley is distinguished, at least, by the feature quoted above in that Bradley fails to disclose how a transmit beamformer is controlled through signals in order to provide output signals to transmit receive array 18.

Accordingly, Applicants respectfully request the Examiner withdraw the rejection to claim 1. Claims 2-9 depend from claim 1 and are allowable, at least, by virtue of their dependency from allowable claim 1.

The Office Action indicated that claims 1 and 10 are rejected under 35 U.S.C. § 102(e) as being anticipated by U. S. Pregant Publication No. US 2003/0236461 A1 to Poland (“Poland”). Applicants respectfully traverse this rejection.

Poland merely discloses a system and method for individually varying the orientation of scan lines in at least two dimensions in an ultrasound scan. (See Abstract.) Specifically, Poland discloses an ultrasound imaging system 300 which includes a transmit beamformer 310 coupled to a transmit receive switch 312 to probe 350. The system 300 can randomly select any point on the matrix probe as a point from which the ultrasonic energy is projected. (See paragraph [0031].) Poland further discloses a system controller 332 which provides overall control of the system. The system controller 332 performs timing and control functions and typically includes a microprocessor operating under control of graphics generator 336 and control routines 342, both contained within memory 340. The control

routines 342 also include scan line control software 370. (See paragraph [0036].) The scan line control software 370 operates on both transmit pulses and receive echoes to effectively alter the position of the origin 401 of the scan line as shown in Figure 4. Utilizing the results of the software, the system controller 332 provides control signals over 300 to pulse generator 316 and transmit beamformer 310. (See paragraph [0045]; Figure 3.)

Conversely, Poland fails to disclose, at least, “a control signal for each channel to generate a carrier drive signal, further wherein the control signal is based upon at least one channel dependent parameter,” as recited in claim 1.

Poland is silent with respect to detailed characteristics of the control signal used to transmit signals through beamformer 310.

Accordingly, Applicants respectfully request the Examiner to withdraw the rejection of claims 1 and 10. Claims 2-9 depend from claim 1 and are allowable, at least, by virtue of their dependency from allowable claim 1.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at (703) 205-8000, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No.

02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17;
particularly, extension of time fees.

Respectfully submitted,

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Attachment(s): Replacement Sheets of Drawings - Figs. 13-17